But even *ampelophila* does not thrive when the temperature reaches 100°.

During September, 1914, I took several wild stocks of *confusa* from the same region, and have examined many of the offspring with the hopes of again finding this form but so far no unusual forms have appeared.

ROSCOE R. HYDE

MUTATIONS IN TWO SPECIES OF DROSOPHILA

IN our cultures of *Drosophila,* mutations have appeared recently in two species other than *Drosophila ampelophila.* Both mutants are characterized by abnormalities in wing venation. One of them has irregular extra veins in the axillary cell, and hence may be called *axillary.* The other is distinguished most clearly by the fusion of the distal end of the second vein to the costa, producing a double vein for a considerable distance, for which reason it is called *confluent.* In each of these cases other abnormal characters are associated with those mentioned, but they are relatively inconspicuous.

The mutant called axillary arose in normal stock of *D. tripunctata* Loew, which has been bred in the laboratory for about six generations. This stock was kept in milk bottles and fed on banana, but received no artificial treatment except anesthesia with ether once per generation. Axillary behaves as a simple Mendelian recessive when crossed with normal, and breeds true in pure cultures.

The mutant called confluent appeared in a culture of an undescribed species of *Drosophila,* referred to as "species B" by one of us in a paper describing its chromosomes.[1] Confluent is a dominant character (*i. e.,* it appears in the heterozygous fly), and so far as we have been able to ascertain it never occurs in the homozygous condition. At least no flies homozygous for it have as yet been found, although numerous matings have been made which should have produced them. The original fly showing the confluent character (a male) appeared in a stock culture, all of his brothers and sisters being normal. He was heterozygous, as shown by matings with normal females, which gave 15 normal and 13 confluent offspring. Seven of the latter, bred

[1] "Chromosome Studies in the Diptera," I, *Jour. Exp. Zool.,* XVII. p. 45, 1914.

to normals in pairs, gave 778 normals and 691 confluents, showing that they too were heterozygous.[2] The remaining six were bred together in pairs and gave 261 normal and 431 confluent progeny, or a ratio of approximately 1:2 instead of the expected 1:3. According to expectation one third of the 431 confluent offspring in this generation should be homozygous, and random matings in pairs (confluent by confluent), should give in five cases out of nine only confluent progeny. Sixteen such matings have been made, none of which gave this result; instead each gave approximately one normal to two confluent, just as did the F_1 heterozygotes. Normal brothers and sisters of confluent in both generations bred *en masse* gave only normals, showing that none of them was heterozygous for confluent. From these data we conclude that the homozygous confluent flies are not viable, and that the 1:2 ratio is due to the total absence of this class. To our knowledge such a condition as this has been previously recorded in only three cases: the "aurea" *Antirrhinum* of Baur, the yellow mouse of Cuenot, Castle, etc., and the dwarf wheat of Vilmorin. Baur's case differs somewhat from the others and from ours in that the homozygous mutant class appears, but soon dies (due to the absence of chlorophyll).

With regard to the origin of mutations the present cases are instructive in showing that they may appear without the use of artificial chemical or physical agents, and without hybridization. No radium, X-rays or any chemicals whatever have been applied to these cultures, except ether, and that only for anesthesia of the adult flies in each generation. The stock of *D. tripunctata* from which axillary arose was obtained wild, and had been inbred for six or seven generations; that of the other species, from which confluent arose, is all descended from one pair of wild flies, almost certainly brother and sister, and had been inbred for about twelve generations when the mutant appeared. In neither case had flies from two localities been crossed; both stocks were pure and inbred. The only agent that could possibly fall under suspicion as a causative one, then, is ether, but this was used uniformly throughout the experiments, and since only two mutations appeared among many thousands of flies, there is no reason for attributing them to the specific

[2] The offspring per pair were respectively: 242 : 194, 93 : 73, 97 : 106, 42 : 47, 133 : 125, 76 : 65, 110 : 94.

effect of ether;[3] a conclusion made even more certain by the fact that other species were bred during the same time, under identical conditions, and with the same treatment, but without the production of mutations. There is every reason to believe, therefore, that the cause of the mutation in each case was purely fortuitous.

One of the aims of our work on the Drosophilas is to apply the chromosome hypothesis to species having chromosomes different from those of *D. ampelophila*. The experimental work of Morgan and others on *D. ampelophila* has pointed directly to the conclusion that the four groups of linked factors which they have studied are located, respectively, in the four pairs of chromosomes of this species. One of us has recently shown in the paper above cited that several other species of *Drosophila* have chromosome groups differing from that of *ampelophila* in the number and relative sizes of the chromosomes. Of the two species considered in the present paper, one, "species B," has six pairs of chromosomes, and should therefore, on the chromosome hypothesis, give six series of linked characters. The other, *D. tripunctata,* has four pairs of chromosomes, but of a type essentially different from that of *ampelophila,* and consequently should also give essentially different linkage series.

It is significant that both of the mutations which we have found (axillary and confluent), are represented by similar mutations in *D. ampelophila*. Judging from these it is not too much to expect that among other mutations which may subsequently arise in our species, some will likewise correspond to some of those in *ampelophila,* and that upon this basis it may be possible to homologize linkage groups, and thus more definitely homologize chromosomes in different species.

C. W. METZ AND B. S. METZ

CARNEGIE INSTITUTION,
STATION FOR EXPERIMENTAL EVOLUTION

A SEX-LINKED CHARACTER IN DROSOPHILA REPLETA

Drosophila repleta Wollaston (*D. punctulata* Loew) is a cosmopolitan species, though only recently introduced into the

[3] Professor Morgan has arrived at the same conclusion with regard to the appearance of mutations in *Drosophila ampelophila.* Cf. AMER. NAT., 1914, "The Failure of Ether to Produce Mutations in *Drosophila.*"